

CLAIMS

1. A punching machine comprising a base frame which defines an upper horizontal work table for working metal sheets and bars, an operating turret positioned above said work table and housing a punching ram, a first support member for at least one male punch holder driven rotationally by a respective first motor assembly and supported on said turret in vertical alignment below said punching ram, a second support member for a female die holder inserted in said work table in vertical alignment with said first support member and driven rotationally by a respective second motor assembly synchronised with said first motor assembly, at least one element for selection and contact with at least one male punch interposed between said ram and said male punch holder driven rotationally by a respective third motor assembly, wherein said male punch holder and female die holder can be driven by respective drive arrangements with synchronous rotational movement around a common vertical axis relative to said first support member and said second support member.

2. A punching machine as defined in claim 1, wherein said first and second support members consist of cylindrical elements, with a number of housings for housing a number of male punch holders and female die holders.

3. A punching machine as defined in claim 2, wherein said male punch holder and said female die holder each consist of a cylindrical magazine for housing respectively a predefined number of male punches and a corresponding number of female dies.

4. A punching machine as defined in claim 1, claim 2, or claim 3, wherein said first support member and said second support member contain corresponding axial housings for insertion, in a rotationally free manner, of cylindrical magazines for male punches and female dies.

5. A punching machine as defined in any one of claims 1 to 4, wherein a device for transmission of said rotational movement is provided between said male punch holder and female die holder and the said respective rotational drive arrangement.

6. A punching machine as defined in any one of claims 1 to 5, wherein cylindrical magazines for housing male punches and female dies are provided perimetrically with a device for mechanical coupling with said rotational drive arrangement and/or with said rotational movement transmission device.

7. A punching machine as defined in any one of claims 1 to 6, wherein said arrangement for rotationally driving said male punch holder and female die holder comprises:

respective motor/gear motor assemblies fixed respectively to said operating turret and to said base frame and mutually synchronised,

a first and a second drive shaft each projecting respectively from said motor/gear motor assemblies,

a corresponding gear member engaged with the free ends of said first and second drive shaft and engageable with said mechanical coupling device and/or with said rotational movement transmission device,

and a support and guide arrangement for said first and second drive shafts.

8. A punching machine as defined in claim 7, wherein said first and second drive shafts are supported vertically, coaxially and with their respective free ends concurrent.

9. A punching machine as defined in claim 7 or claim 8, wherein said motor assemblies are controlled by a member for angular indexing of rotation.

10. A punching machine as defined in any one of claims 7, 8 or 9, wherein said support and guide arrangement for said first drive shaft comprises:

an abutment projecting from said operating turret of said punching machine provided with axial cavity, in which said first drive shaft can be accommodated in a coaxial traversing manner,

a device for axial retention of said first drive shaft in said abutment, and

a device for the rotationally free passage of the lower of said first drive shaft through said first support member of at least one male punch holder.

11. A punching machine as defined in any one of claims 7 to 10, wherein, at least between said first drive shaft and said support and guide arrangement, there is provided a device for controlling the axial clearance of said first drive shaft.

12. A punching machine as defined in any one of the preceding claims when dependent upon both claim 2 and claim 10, wherein said device for the rotationally free passage of said first drive shaft comprises:

a through opening formed centrally in a first of said cylindrical elements with a number of housings, and

an anti-friction member interposed between said lower end of said first drive shaft and said opening, located in the respective housings formed therein.

13. A punching machine as defined in claim 10 or claim 12, wherein said device for axial retention of said first drive shaft in said abutment comprises:

a rotationally fixed cylindrical liner, inside which said first drive shaft can be accommodated in a rotationally free manner and which is interposed between this and the internal cavity of said abutment and between this and said opening,

a thread formed peripherically on said lining upstream of said abutment,

a first ring nut resting against said abutment fitted coaxially onto said lining and screwable onto said thread for the axial movement of said lining pushing against said abutment, and

a lower edge projecting radially from said lining, for axial retention of said lining inside said opening pressing against the tightening of said first ring nut.

14. A punching machine as defined in claim 11 and claim 13, wherein said device for controlling the axial clearance of said first drive shaft comprises:

a box-shaped support mounted integrally on the head of said lining vertically traversable by the upper end of said first drive shaft,

a second perimetral thread formed on said first drive shaft substantially in the position of said box-shaped support, and

a second ring nut that can be retained in said box-shaped support and screwable onto said second thread for the axial movement of said first drive shaft

relative to said lining.

15. A punching machine as defined in any one of the preceding claims when dependent upon any one of claims 7, 8 or 9, wherein said support and guide arrangement for said second drive shaft comprises:

a coupling flange projecting from said base frame of said punching machine and provided with an axial cavity, in which said second drive shaft can be accommodated in a coaxial traversing manner,

a device for axial retention of said second drive shaft in said flange, and

a device for the rotationally free passage of said second drive shaft through said second support member of at least one female die holder.

16. A punching machine as defined in claim 15, wherein at least between said second drive shaft and said support and guide arrangement, there is provided a device for controlling the axial clearance of said second drive shaft.

17. A punching machine as defined in claim 2 and either claim 15 or claim 16, wherein said means for the rotationally free passage of said upper end of said second drive shaft comprises:

a cylindrical body with axial cavity engaged centrally in said cylindrical elements with a number of housings, and

an anti-friction member interposed between said upper end of said second drive shaft and said cylindrical body, located in said housings formed therein.

18. A punching machine as defined in claims 15 and 17, wherein said device for axially retaining said second drive shaft in said coupling flange comprises:

a second rotationally fixed cylindrical liner, inside which said second drive shaft can be accommodated in a rotationally free manner and which is interposed between this and said internal cavity of said coupling flange and between this and said cylindrical body,

a third thread formed peripherically on said second liner downstream of said coupling flange, and

a third ring nut resting on said coupling flange fitted coaxially onto said second liner and screwable onto said third thread for axial movement of said second liner pressing against said coupling flange.

19. A punching machine as defined in any one of the preceding claims when dependent upon claim 16, wherein said device for controlling the axial clearance of said second drive shaft comprises:

a second box-shaped support mounted integrally at the base of said second liner and vertically transversable by the lower end of said second drive shaft,

a fourth perimetral thread formed on said second drive shaft substantially in the position of said second box-shaped support, and

a fourth ring nut which can be retained in said second box-shaped support and is screwable onto said fourth thread for the axial movement of said second drive shaft relative to said coupling flange.

20. A punching machine as defined in any one of the preceding claims when dependent upon claim 3 and claim 7, wherein said device for transmission of

rotational movement consists of ring gears that perimetrically enclose said cylindrical magazines and are engageable with said gear member.

21. A punching machine as defined in any one of the preceding claims when dependent upon claims 7 and 20, wherein said device for transmission of rotational movement consists of corresponding perimetrically toothed idle rollers which are interposable between said gear member and said ring gears.

22. A punching machine as defined in any one of the preceding claims when dependent upon claim 7, wherein said gear member consists of respective sprockets engaged in a rotationally fixed manner to the concurrent ends of the first and the second drive shafts.

23. A punching machine as defined in any one of the preceding claims when dependent upon claims 2 and 15, wherein an elastic shock-absorbing arrangement is interposed at least between the enlarged head of said second cylindrical liner and said flange.

24. A punching machine as defined in claim 23, wherein said elastic shock-absorbing arrangement consists of at least one Belleville washer.

25. A punching machine substantially as hereinbefore described with reference to the drawings.